NON-PUBLIC?: N
ACCESSION #: 8808300112
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Salem Generating Station - Unit 2 PAGE: 1 of 3

DOCKET NUMBER: 05000311

TITLE: Reactor Trip Due To "C" Vital Instrument Bus Inverter Failure
EVENT DATE: 07/30/88 LER #: 88-016-00 REPORT DATE: 08/18/88

OPERATING MODE: 1 POWER LEVEL: 080

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: M. J. Pollack - LER Coordinator TELEPHONE #: 609-339-4022

COMPONENT FAILURE DESCRIPTION:
CAUSE: B SYSTEM: EE COMPONENT: INVT MANUFACTURER: G037
REPORTABLE TO NPRDS: Y

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT: On 7/30/88, during power reduction operations, a reactor trip occurred. The "first out" overhead annunciation was "Turbine Trip - P-7". The root cause of this event has been attributed to equipment problems associated with the "C" Vital Instrument Bus (VIB) inverter. Just prior to the trip, a "C" VIB inverter failure indication was received in the Control Room. The failure did not cause a reactor trip since the VIB voltage loss lasted for less than 10 milliseconds. To prevent a reactor trip from occurring, power reduction to less than 36% (P-8) at 1%/minute was initiated. When power reached 80%, a reactor trip occurred as the "C" VIB voltage dropped to a value low enough for relay operation for 67 milliseconds. The first out annunciation indication of No. 23 RCP breaker open was not received since the signal mustlast for at least 250 milliseconds to actuate the alarm. However, the reactor trip would generate a turbine trip causing the first out annunciator to lock in on "Turbine Trip - P-7". The "C" VIB Inverter has been repaired. The Unit was returned to service on 7/31/88. A design change has been initiated to delete the reactor trip logic which occurs when "one out of four RCP breakers open" is met. It will be implemented during the upcoming fourth refueling outage. A similar design change for Salem Unit 1 will be implemented during its next refueling outage. Both Salem Unit 1 and

Salem Unit 2 inverters will be replaced with state of the art equipment during their respective 8th and 5th refueling outages.

(End of Abstract)

PLANT AND SYSTEM IDENTIFICATION:

Westinghouse - Pressurized Water Reactor

Energy Industry Identification System (EIIS) codes are identified in the text as (xx)

IDENTIFICATION OF OCCURRENCE:

Reactor Trip Due To "C" Vital Instrument Bus Failure

Event Date: 7/30/88

Report Date: 8/18/88

This report was initiated by Incident Report Nos. 88-296 & 88-297.

CONDITIONS PRIOR TO OCCURRENCE:

Mode 1 Reactor Power 80% - Unit Load 900 MWe

DESCRIPTION OF OCCURRENCE:

On July 30, 1988 at 1810 hours, during power reduction operations, a reactor trip occurred. The "first out" overhead annunciation was "Turbine Trip - P-7". A reactor trip will occur if the Turbine trips with the plant above P-7 (10% power).

The Unit was stabilized in Mode 3 (Hot Standby), and in accordance with the requirements of the Code of Federal Regulations 10CFR 50.72(b)(2)(ii), the Nuclear Regulatory Commission was notified of the automatic actuation of the Reactor Protection System (JC).

APPARENT CAUSE OF OCCURRENCE:

The root cause of this event has been attributed to equipment problems associated with the "C" Vital Instrument Bus (VIB) inverter (EF).

Just prior to the trip, "C" VIB inverter failure indication was received

in the Control Room. The failure did not cause a reactor trip since the VIB voltage loss lasted for less than 10 milliseconds. To prevent a reactor trip from occurring, power reduction to less than 36% (P-8 - 1/4 Reactor Coolant Pump (RCP) Breakers Open) at 1%/minute was initiated. When power reached approximately 80%, a reactor trip occurred as the "C" VIB voltage dropped to a value low enough for relay operation for 67 milliseconds. The first out annunciation indication of No. 23 RCP breaker open was not received since the signal must last for at least 250 milliseconds to actuate the alarm. However, the reactor trip would generate a turbine trip causing the first out annunciator to lock in on "Turbine Trip - P-7".

Investigation of the "C" VIB inverter revealed that the inverter conduction angle control circuit diodes failed. Their failure caused a short of the DC input to the inverter resulting in high current causing the main power circuit fuses to blow.

ANALYSIS OF OCCURRENCE:

The failure of the "C" Vital Instrument Bus inverter apparently caused a false RCP breaker open signal in the SSPS (momentary loss of power to the SSPS input relay coils) resulting in the reactor trip. The logic for this trip is "one out of four" when the Unit is operated above permissive P-8 (36% power). With the Unit operating at 80% power, the reactor tripped. This trip is an anticipatory trip for a pending loss of Reactor Coolant System (RCS) (AB) flow or reduced flow condition.

The loss of the "C" VIB resulting in a reactor trip is not unique, although,
the circumstances initiating the "C" VIB failure is
unique. Three (3) other reactor trip events have occurred as a result of the loss of "C" VIB, reference LERs 311/88-014-00, 311/86-007-00 and 311/85-022-00.

Equipment and systems responded properly to the "indicated" loss of RCS flow. This event involved no undue risk to the health or safety of the public. However, because of the automatic actuation of the Reactor Protection System, this event is reportable in accordance with the requirements of the Code of Federal Regulations, 10CFR 50.73(a)(2)(iv).

CORRECTIVE ACTION:

The "C" Vital Instrument Bus Inverter has been repaired. The Unit was returned to service on July 31, 1988.

A design change has been initiated (2EC-2245) to delete the reactor trip logic which occurs when "one out of four RCP breakers open" is met. As stated in the Analysis of Occurrence section, this trip is anticipatory and is not taken credit for in the accident analysis for the station. This design change will be implemented during the upcoming fourth refueling outage. A similar design change for Salem Unit 1 will be implemented during its next refueling outage.

Both Salem Unit 1 and Salem Unit 2 inverters will be replaced with state of the art equipment during their respective 8th and 5th refueling outages.

/s/
General Manager -
Salem Operations

MJP:pc

SORC Mtg. 88-067

ATTACHMENT # 1 TO ANO # 8808300112 PAGE: 1 of 1

PSE&G

Public Service Electric and Gas Company
P.O. Box E Hancocks Bridge, New Jersey 08038

Salem Generating Station

August 18, 1988

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Dear Sir:

SALEM GENERATING STATION
LICENSE NO. DPR-75
DOCKET NO. 50-311
UNIT NO. 2
LICENSEE EVENT REPORT 88-016-00

This Licensee Event Report is being submitted pursuant to the requirements of the Code of Federal Regulations 10CFR 50.73(a)(2)(i)(B). This report is

required within thirty days of discovery.

Sincerely yours,
/s/ J. M. Zupko, Jr.
J. M. Zupko, Jr.
General Manager -
Salem Operations

MJP:pc

Distribution

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